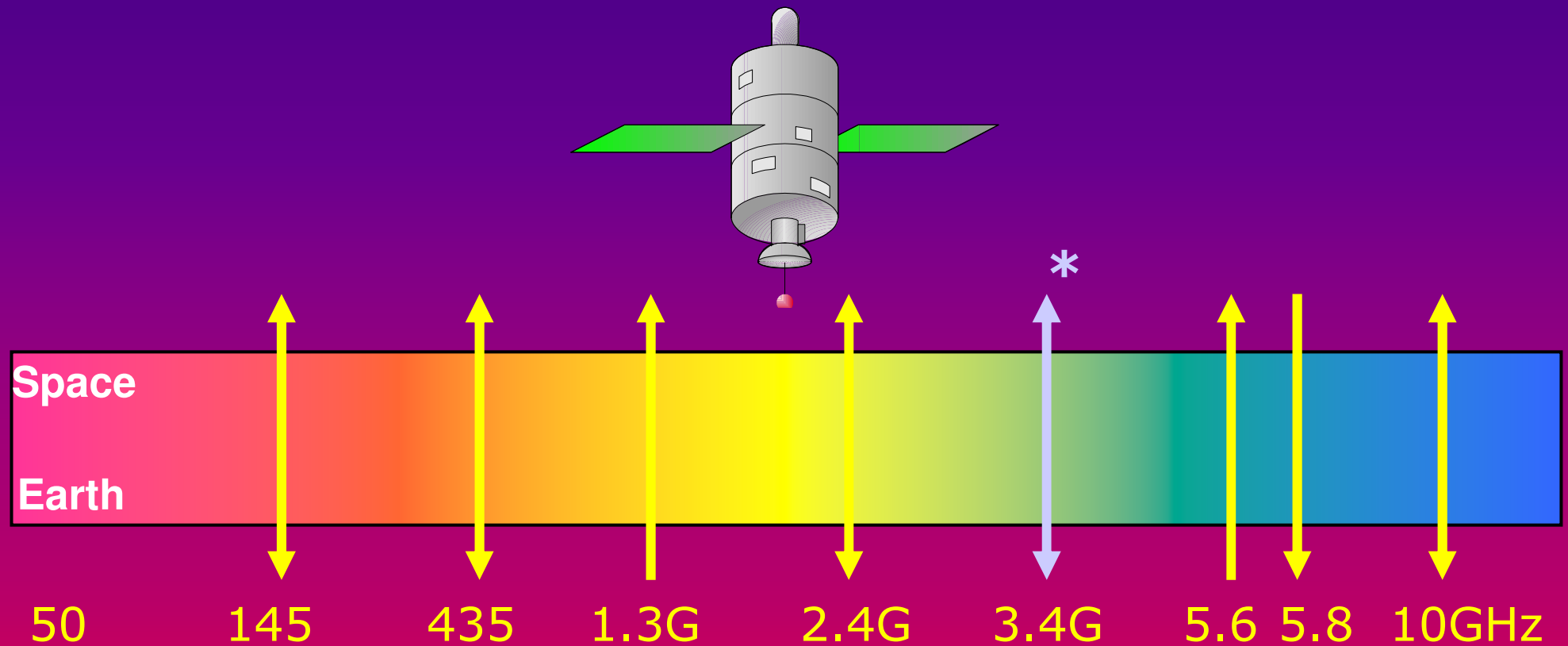


The Future of the Amateur Satellite Service Spectrum

VHF/Microwave Allocations



* Region-2/3 Only – not used so far

Only 145 is Primary...

Key: S-E ↓ E-S ↑ Both ↔

Amateur Satellite Service

- **RR1.56 Amateur Service:**

A radiocommunication service for the purpose of selftraining, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

- **RR1.57 Amateur-Satellite Service:**

A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service

Key Satellite Regs

- **RR5.282**

In the bands 435-438MHz, 1260-1270MHz, 2400-2450MHz, 3400-3410MHz (in Regions 2 and 3 only) and 5650-5670 MHz, the amateur-satellite service may operate **subject to not causing harmful interference** to other services

- Administrations authorizing such use shall ensure that any **harmful interference** caused by emissions from a station in the amateur-satellite service is immediately eliminated in accordance with the provisions of **No. 25.11**.
- The use of the bands 1260-1270 MHz and 5650-5670 MHz by the amateur-satellite service is limited to the Earth-to-space direction.

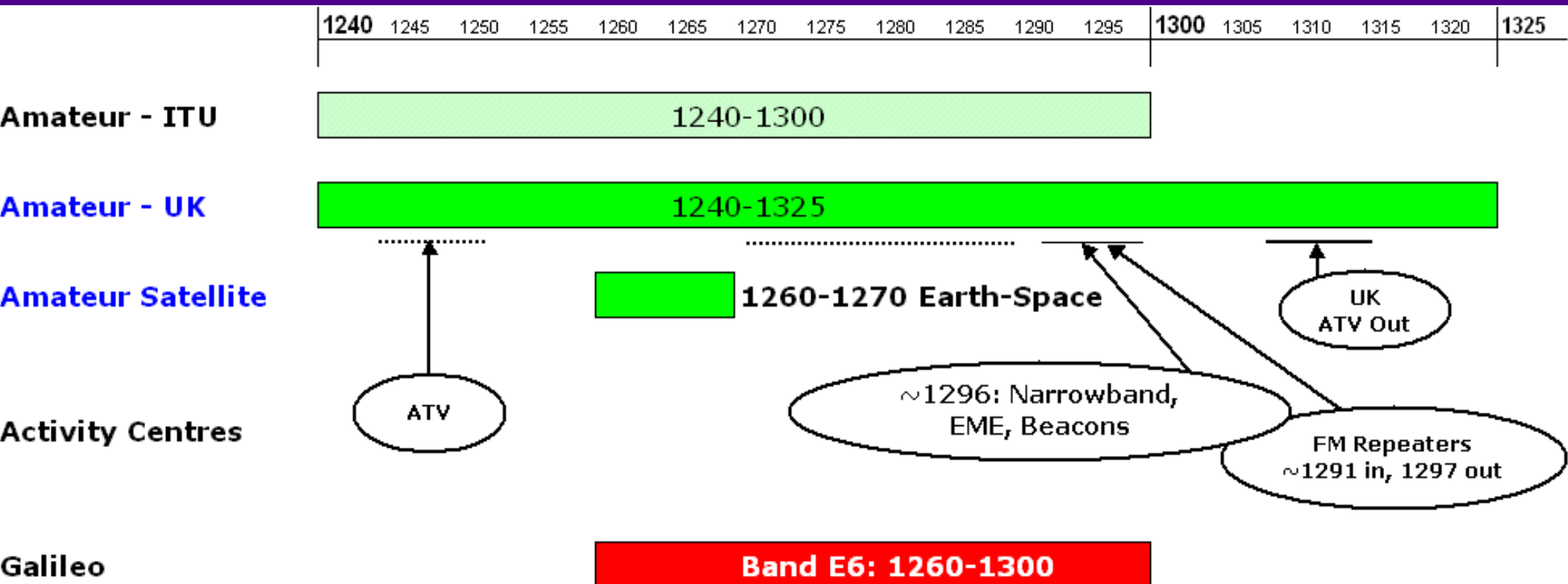
More Regs

- **22.1** Space stations shall be fitted with devices to ensure immediate cessation of their radio emissions by telecommand, whenever such cessation is required under the provisions of these Regulations.
- **25.11** Administrations authorizing space stations in the amateur-satellite service shall ensure that sufficient earth command stations are established before launch to ensure that any harmful interference caused by emissions from a station in the amateur-satellite service can be terminated immediately (see No. 22.1). (WRC-03)
- **BUT WOULD FLYING A 50MHz SURVEY RECEIVER OR NATIONAL UPLINKS BE A REAL BREACH ? – NO HARMFUL INTERFERENCE...**
cf. downlinks

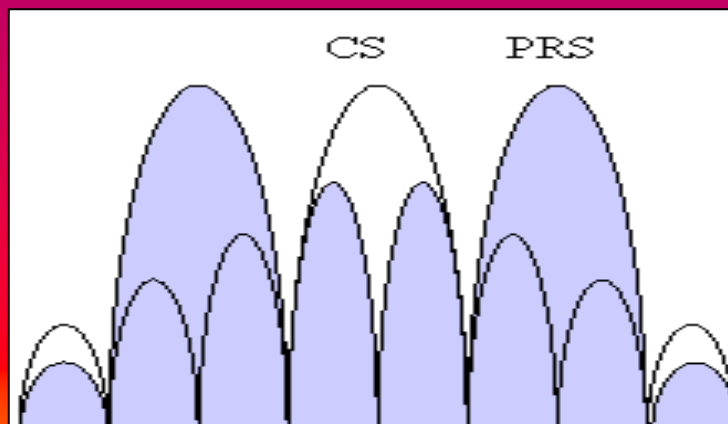
Threat Review

- See 2005 Amsat-UK Colloquium Proceedings
- Some are our own fault:
 - Most allocations are smaller than terrestrial ones nor well aligned
- So just a few examples now...

23cms & Galileo



Galileo E6 Services:
CS: Commercial Service
PRS: Public Regulated Service



**1278.75MHz centre
 +/- 20 x 1.023MHz**

A 23cms Study

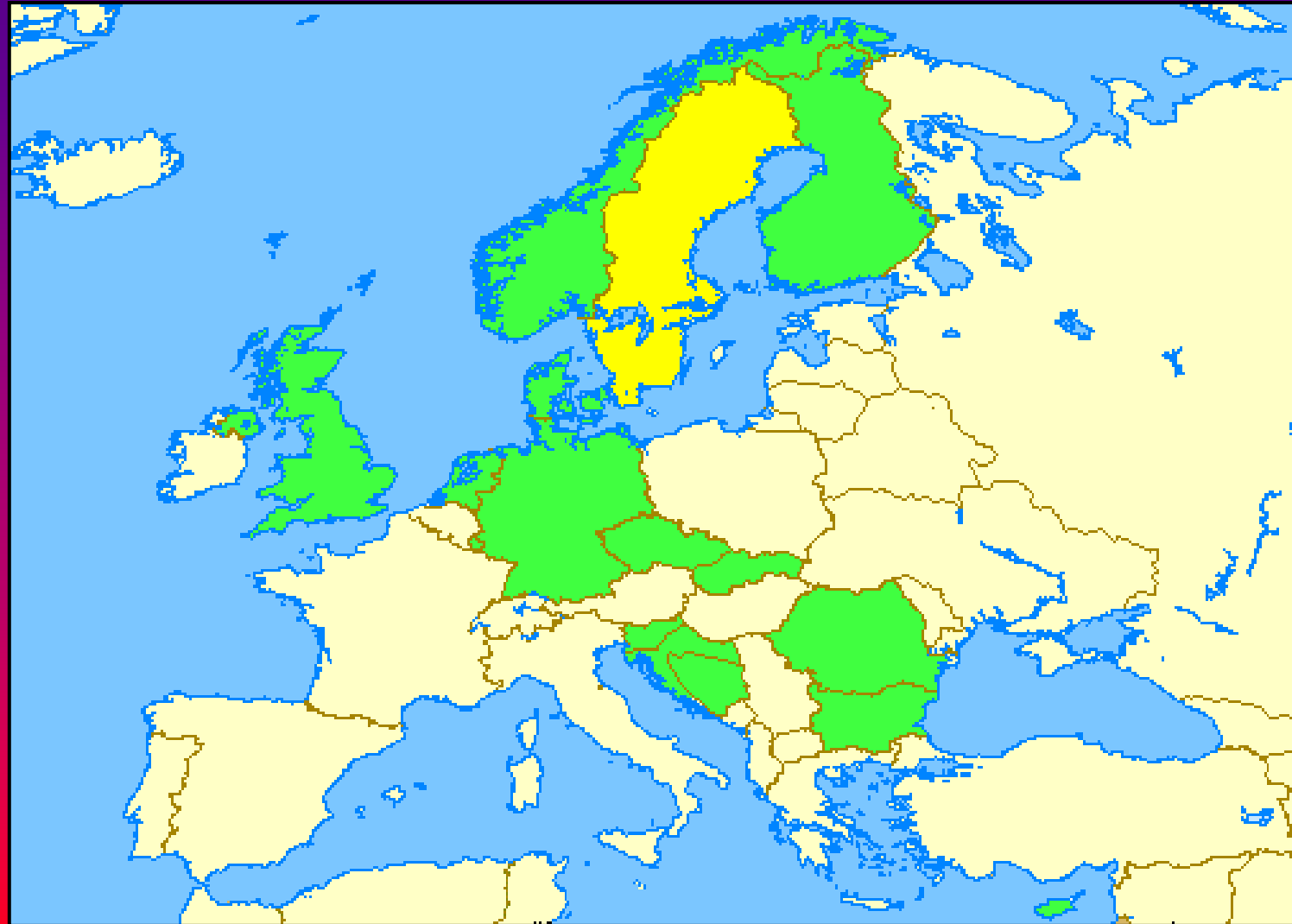
- In the UK 1260-1270 has ATC radar and other PU systems
- New 2500-2690 MHz 3/4G must not get harmonic interference
- Concerns over Galileo in 1260+
 - more likely to happen if Publicly funded by EU
- RSGB Vienna Paper B15 has actioned a review of fallback plans to be discussed at IARU-R1 Cavtat 2008 conference based on a new 10MHz band – 1240/50, 1260/70 or 1290/1300 MHz

3.4GHz Amateur Allocations

- In Region-1 the low allocation level and lack of formal ITU allocation can severely undermine use in Region-2/3
- WRC-07 AI 1.4 likely to see 3400-3600 being designated for IMT-Advanced (aka 4G)
- 3.4-3.6 Already allocated for FWA and is an EU Common Position for IMT

3.4GHz in Europe

- Most are 3400-3410MHz
- Only UK & Germany had more
- Key for P3 and P4 projects & escaping 2.4G QRM



3.4GHz and WRC-07

- 3.4GHz could be 'designated' for IMT-Advanced and 'lost'
- RSGB Position on WRC-07 AI 1.4:
- *Any position that is adopted should account for incumbent users spectrum requirements. In this regard we highlight the Spectrum Requirement to extend the 3400-3410MHz Amateur Satellite Service allocation to ITU Region-1, harmonising all three ITU regions.*
- *If both the Amateur and Amateur Satellite Services were given globally harmonised protected allocations in this lower 10MHz range we would be prepared to consider greater sharing in the spectrum above 3410.*
- **ie We should trade wider allocations to unify 3400-3410 before its too late**

Spectrum Defence

- Do we deserve to keep allocations if we don't use them...?
- We need a concept of 'BeaconSats'
- Use full size Sats or Cubesats to fly a simple beacon on every band
- Put new Terrestrial Beacons on Sat Freqs
- Benefits Spectrum issues, Propagation, spurs wider variety of Tx and Rx designs

Opportunities

- Don't accept it takes 15 years of WRCs to get an allocation!
- Work more closely between Amsats and with NatSocs & IARU
- IARU Only has observer status at WRCs
- Can we get some quick wins...?
- Can we achieve
'common narrowband segments'

The Case for 50MHz

- No allocation between 30MHz and 144MHz
- Antennas Still Practical compared to HF
- Fewer commercial users.
 - Potential for exclusive use in 50-51MHz
- Low Doppler
- Scope for Innovative Propagation Research
- 6m Band likely to be a WRC-11 IARU target
- BUT Satellites NOT in IARU Requirement at <http://www.iaru.org/ac-spec06.html>

Design for The Future

- Designs needed for
- Beacons
- Frequency agility in longer lived designs to permit allocation changes
- Fly 'Survey receivers'
- Acquire Uplink Rights
- Exploit DDS Synthesisers and SDR more

EU Alignment Issues

- **EU17:** In the sub-bands 3400-3410MHz, 5660-5670MHz, 10.36-10.37GHz, 10.45-10.46GHz the amateur service operates on a secondary basis. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these sub-bands in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.
- **EU23:** In the sub-bands 5660-5670MHz (earth to space), 5830-5850MHz (space to earth) and 10.45-10.50GHz the amateur-satellite service additionally operates on a secondary and non-interference basis to other services. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these allocations in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.

Frequency Change Proposals

Band	Requirement/Action	Priority
50-51MHz	Seek new harmonised Amateur Satellite Service E-S/S-E allocation for communications and propagation research to complement existing Amateur Service requirements.	1B
438-440MHz	Extension to existing allocation – E-S & S-E	2A
1240-1250MHz	E-S & S-E - trade for relinquishing existing 1260-1270*, coordinated with existing Amateur Service requirements/priorities	1B
2300-2330MHz	E-S & S-E - trade for relinquishing existing 2400-2450MHz - reduce mutual problems with other services	3A
2390-2400MHz	E-S & S-E - trade for relinquishing existing Amateur Satellite Service allocation at 2400-2450MHz - reduce problems with other services NB1: The Amateur Service is already Primary in USA 2390-2395MHz and shared Primary 2395-2400MHz NB2: Retaining 2400-2450 for the Amateur Service is still believed to be beneficial at this time despite increasing ISM interference issues	1A
3400-3410MHz	E-S & S-E - trade for relinquishing all 3410-3500MHz and seek protection from WRC-07/11 IMT/BWA Comms services Already available in ITU Regions 2&3 – The lack of a Region-1 allocation inhibits use	1A
5650-5670MHz	E-S & S-E -upgrade from E-S only - trade for reducing width of current 5830-5850 allocation	3A
10GHz	The satellite service requires 10MHz of Primary allocation..... Consider a move/extension towards the 10360-10400 area in exchange for relinquishing 10460-10500 Press for 10450-10460 to be upgraded to Primary	3B

Common Segments ?

Current UK Terrestrial Allocations				Possible Future Allocations			
Fstart	Fstop	BW, MHz			Fstart	Fstop	BW, MHz
1240	1325	85			1240	1250	10
2310	2400	90			2310	2330	20
2400	2450	50			2390	2400	10
3400	3475	75			3400	3420	20
5650	5680	30			5650	5670	20
5755	5765	10			5755	5765	10
5820	5850	30			?	?	0
10000	10125	125			?	?	0
10225	10475	250			10360	10460	100
24000	24050	50			24000	24050	50
24050	24150	100			trade-in		
24150	24250	100			trade-in		
Total		995					240

- Important to harmonise with Narrowband, Amsat & EME – Worldwide DX
- Preserve enough for ATV
- A Long term plan – that starts now!

144MHz at IARU Meeting in Vienna

- Proposal to enable more spectrum for satellite operations around 144.35 MHz
- **New Opportunity:-**
Old 144.000/035 EME Allocation is globally harmonised but largely neglected since 144.100+ now in greater use
- **Action point for the Satellite Coordinator G3VZV:**
To review Vienna discussions, to analyse information from the other regions, and to consider submitting a further paper at the 2008 follow-up conference, including full justification for the need to act.

Summary

- Future could be bright and exciting if Amsat(s) convince IARU Member Societies to back them
- Its up to you.....!